USER'S MANUAL

Multimeter
Auto ranging Compact DMM

DMR-6500

CIRCUIT-TEST ELECTRONICS
www.circuittest.com

Introduction

This meter measures AC/DC Voltage, AC/DC Current, Resistance, Capacitance, Frequency, Diode Test, Continuity plus Thermocouple Temperature. Proper use and care of this meter will provide many years of reliable service.

Safety

This symbol adjacent to another symbol, terminal or operating device indicates that the operator must refer to an explanation in the Operating Instructions to avoid personal injury or damage to the meter.

WARNING

This WARNING symbol indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.

CAUTION

This CAUTION symbol indicates a potentially hazardous situation, which if not avoided, may result damage to the product.

This symbol advises the user that the terminal(s) so marked must not be connected to a circuit point at which the voltage with respect to earth ground exceeds (in this case) 500 VAC or VDC.

This symbol adjacent to one or more terminals identifies them as being associated with ranges that may, be subjected to particularly hazardous voltages. For maximum safety, the meter and test leads should not be handled when these terminals are energized.

Double Insulation.

SAFETY INFORMATION

Caution and proper guidelines must be followed for personal and product safety. Read this instruction manual carefully and completely before using the meter. Lack of caution or poor safety practices can result in serious injury or death.

- Always start with power off. Set the function switch to the correct setting before making any measurements and do not change position of the function switch during measurements.
- Do not use the meter if the meter or test leads look damaged or if there is doubt that the meter is not operating properly.
- When using the test probes always keep fingers behind the finger guards. Never touch the exposed probe tip.
- Always consider circuits to be energized. Never assume any equipment to be de-energized.
- Use caution when working above 35VDC or 25VAC RMS as these voltages pose a shock hazard.
- Never connect unit to AC or DC powered circuits when the function switch is set to resistance, diode check or continuity ranges.
- Always disconnect the power when performing resistance, or diode tests.
- Always turn off the power to the circuit under test before unsoldering or breaking the circuits. Small amount of current can be dangerous.
- Disconnect test leads before removing the batteries or the fuse.
- Do not operate the unit unless the case is completely closed.

SAFETY INSTRUCTIONS

This meter has been designed for safe use, but must be operated with caution. The rules listed below must be carefully followed for safe operation.

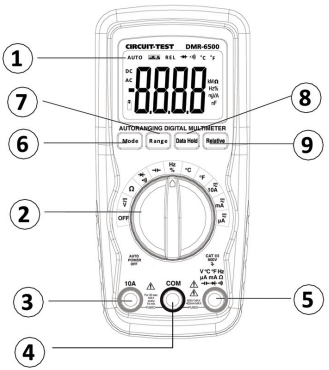
1. **NEVER** apply voltage or current to the meter that exceeds the specified maximum:

Input Limits	
Function	**Maximum Input**
V DC or V AC	600V DC/VAC
µA, mA DC/AC	400mA DC/AC
A DC/AC	10A DC/AC (30 seconds max every 15 minutes)
Frequency, Resistance, Capacitance, Temperature Duty Cycle, Diode, Continuity	250V DC/AC rms

2. **USE EXTREME CAUTION** when working with high voltages.
3. **NEVER** connect the meter leads across a voltage source while the function switch is in the current, resistance, or diode mode. Doing so can damage the meter.
4. **ALWAYS** discharge filter capacitors in power supplies and disconnect the power when making resistance or diode tests.
5. **ALWAYS** turn off the power and disconnect the test leads before opening the covers to replace the fuse or batteries.
6. **NEVER** operate the meter unless the back cover and the battery and fuse covers are in place and fastened securely.

Controls and Jacks

1. 4000 count LCD Display
2. Function switch
3. 10A (positive) input jack for 10A DC or AC
4. COM (negative) input jack
5. Positive input jack
6. MODE button
7. Range button
8. Data Hold button
9. Relative button



Symbols and Annunciators

•))	Continuity
	Low Battery
→|	Diode
HOLD	Data Hold
AUTO	AutoRanging
AC	Alternating Current or Voltage
DC	Direct Current or Voltage

Specifications

Display:	4000 counts LCD display.
Polarity:	Automatic, (-) negative polarity indication.
Input Impedance:	7.8MΩ
Overrange:	"OL" mark indication.
Low battery indication:	is displayed if the battery voltage drops below operating voltage.
Measurement rate:	2 times per second, nominal.
Auto power off:	Automatically shuts down after approx. 15 minutes of inactivity.
Operating Temperature:	0ºC to 50ºC (32ºF to 122ºF) at < 70 % relative humidity.
Storage temperature:	-20ºC to 60ºC (-4ºF to 140ºF) at < 80 % relative humidity.
Fuse:	10A/250V, 500mA/250V Fast blow 5x20mm
Battery:	One 9V, NEDA 1604 battery.
Dimensions:	150 (H) x 70 (W) x 48 (D) mm
Weight:	Approx. 255g.
Enclosure:	Double molded
Safety / Approvals:	This meter is UL and CUL approved and conforms to IEC61010-1 for Overvoltage Category CAT III 600V.

DC Voltage

Range	Resolution	Accuracy
400.0mV	0.1mV	±0.5% of reading ± 2 digits
4.000V	1mV	±1.2% of reading ± 2 digits
40.00V	10mV	
400.0V	100mV	
600V	1V	±1.5% of reading ± 2 digits

AC Voltage

Range	Resolution	Accuracy
400.0mV	0.1mV	±1.5%of reading ± 15 digits
4.000V	1mV	±1.2% of reading ± 3 digits
40.00V	10mV	±1.5% of reading ± 3 digits
400.0V	100mV	
600V	1V	±2.0% of reading ± 4 digits

DC Current

Range	Resolution	Accuracy
400.0uA	0.1uA	±1.0% of reading ± 3 digits
4000uA	1uA	±1.5% of reading ± 3 digits
40.00mA	10uA	
400.0mA	100uA	
10A	10mA	±2.5% of reading ± 5 digits

AC Current

Range	Resolution	Accuracy
400.0uA	0.1uA	±1.5% of reading ± 5 digits
4000uA	1uA	±1.8% of reading ± 5 digits
40.00mA	10uA	
400.0mA	100uA	
10A	10mA	±3.0% of reading ± 7 digits

Overload Protection: 0.5A / 250V and 10A / 250V Fuse.
Note: Accuracy is given at 18ºC to 28ºC (65ºF to 83ºF), < 70 % RH

Resistance

Range	Resolution	Accuracy
400.0Ω	0.1Ω	±1.2% of reading ± 4 digits
4.000kΩ	1Ω	±1.0% of reading ± 2 digits
40.00kΩ	10Ω	±1.2% of reading ± 2 digits
400.0kΩ	100Ω	
4.000MΩ	1kΩ	
40.00MΩ	10kΩ	±2.0% of reading ± 3 digits

Capacitance (Auto-ranging)

Range	Resolution	Accuracy
4.000nF	1pF	±5.0% of reading ± 50 digits
40.00nF	10pF	±5.0% of reading ± 7 digits
400.0nF	0.1nF	±3.0% of reading ± 5 digits
4.000uF	1nF	
40.00uF	10nF	
200.0uF	0.1uF	±5.0% of reading ± 5 digits

Frequency (Auto-ranging)

Range	Resolution	Accuracy
9.999Hz	0.001Hz	±1.5% of reading ± 5 digits
99.99Hz	0.01Hz	
999.9Hz	0.1Hz	±1.2% of reading ± 3 digits
9.999kHz	1Hz	
99.99kHz	10Hz	
999.9kHz	100Hz	
9.999MHz	1kHz	±1.5% of reading ± 4 digits

Sensitivity: >0.5V RMS while ≤1MHz;

Sensitivity: >3V RMS while >1MHz

Duty Cycle

Range	Resolution	Accuracy
0.1%~99.9%	0.1%	±1.2% of reading ± 2 digits

Pulse width: >100us, <100ms;

Frequency width: 5Hz – 150 kHz

Sensitivity: >0.5V RMS

Temperature

Range	Resolution	Accuracy
-20ºC~+760ºC	1ºC	±3% of reading ±5ºC/9ºF
-4ºF~+1400 ºF	1ºF	

Sensor: Type K Thermocouple

Diode Test

Range	Resolution	Accuracy
0.3mA typical	1 mV	±10% of reading ± 5 digits

Open circuit voltage: 1.5V dc typical

Audible continuity

Audible threshold: Less than 150Ω Test current: <0.3mA

WARNING: Risk of electrocution. High-voltage circuits, both AC and DC, are very dangerous and should be measured with great care.

1. ALWAYS turn the function switch to the OFF position when the meter is not in use. This meter has Auto OFF that automatically shuts the meter OFF if 15 minutes elapse between uses.
2. If "OL" appears in the display during a measurement, the value exceeds the range you have selected. Change to a higher range.

NOTE: On some low AC and DC voltage ranges, with the test leads not connected to a device, the display may show a random, changing reading. This is normal and is caused by the high-input sensitivity. The reading will stabilize and give a proper measurement when connected to a circuit.

Autoranging/Manual Range Selection

When the meter is first turned on, it automatically goes into Autoranging. This automatically selects the best range for the measurements being made and is generally the best mode for most measurements. For measurement situations requiring that a range be manually selected, perform the following:

1. Press the **RANGE** key. The "**AUTO**" display indicator will turn off.
2. Press the **RANGE** key to step through the available ranges until you select the range you want.
3. To exit Manual Ranging, press and hold **RANGE** key for 2 seconds.

NOTE: Manual ranging does not apply for Capacitance, Frequency functions.

MODE Button

To select Diode/Continuity, DC/AC Hz/%Duty

HOLD Button

The hold function freezes the reading in the display. Press the **HOLD** key momentarily to activate or to exit the **HOLD** function.

RELATIVE Button

The relative measurement feature allows you to make measurements relative to a stored reference value. A reference voltage, current, etc. can be stored and measurements made in comparison to that value. The displayed value is the difference between the reference value and the measured value.

1. Perform any measurement as described in the operating instructions.
2. Press the RELATIVE button to store the reading in the display and the "**REL**" indicator will appear on the display.
3. The display will now indicate the difference between the stored value and the measured value.
4. Press the RELATIVE button to return to normal operation.

DC Voltage Measurements

CAUTION: Do not measure DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

1. Set the function switch to the $\overline{\underset{\sim}{\overline{V}}}$ position.
2. Press **MODE** (if required) so DC appears on the display.
3. Insert the black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the positive **V** jack.
4. Touch the test probe tips to the circuit under test. Be sure to observe the correct polarity (red lead to positive, black lead to negative).
5. Read the voltage in the display.

AC Voltage Measurements

WARNING: Risk of Electrocution. The probe tips may not be long enough to contact the live parts inside some 240V outlets for appliances because the contacts are recessed deep in the outlets. As a result, the reading may show 0 volts when the outlet actually has voltage on it. Make sure the probe tips are touching the metal contacts inside the outlet before assuming that no voltage is present.

CAUTION: Do not measure AC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

1. Set the function switch to the $\overline{\underset{\sim}{\overline{V}}}$ position.
2. Press **MODE** (if required) so AC appears on the display.
3. Insert the black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the positive **V** jack.
4. Touch the test probe tips to the circuit under test.
5. Read the voltage in the display.

DC Current Measurements

CAUTION: Do not make current measurements on the 10A scale for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads.

1. Insert the black test lead banana plug into the negative **COM** jack.
2. For current measurements up to 4000µA DC, set the function switch to the µA position and insert the red test lead banana plug into the (µA) jack.
3. For current measurements up to 400mA DC, set the function switch to the mA range and insert the red test lead banana plug into the (mA) jack.
4. For current measurements up to 10A DC, set the function switch to the **10A̲** position and insert the red test lead banana plug into the 10A jack.
5. Press the **MODE** button until “DC” appears in the display.
6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
7. Touch the black test probe tip to the negative side of the circuit. Touch the red test probe tip to the positive side of the circuit.
8. Apply power to the circuit.
9. Read the current in the display.

AC Current Measurements

WARNING: To avoid electric shock, do not measure AC current on any circuit whose voltage exceeds 250V AC.

CAUTION: Do not make current measurements on the 10A scale for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads.

1. Insert the black test lead banana plug into the negative **COM** jack.
2. For current measurements up to 4000µA AC, set the function switch to the µA position and insert the red test lead banana plug into the (µA) jack.
3. For current measurements up to 400mA AC, set the function switch to the mA range and insert the red test lead banana plug into the (mA) jack.
4. For current measurements up to 10A AC, set the function switch to the **10A** position and insert the red test lead banana plug into the 10A jack.
5. Press the **MODE** button until “AC” appears in the display.
6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
7. Touch the black test probe tip to the negative side of the circuit. And touch the red test probe tip to the positive side of the circuit.
8. Apply power to the circuit.
9. Read the current in the display.

Resistance Measurements

WARNING: To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements. Remove the batteries and unplug the line cords.

1. Set the function switch to the **Ω** position.
2. Insert the black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the positive **Ω** jack.
3. Touch the test probe tips across the circuit or part under test. It is best to disconnect one side of the part under test so the rest of the circuit will not interfere with the resistance reading.
4. Read the resistance in the display. The display will indicate the proper decimal point, value and symbol.

Continuity Check

WARNING: To avoid electric shock, never measure continuity on circuits or wires that have voltage on them.

1. Set the function switch to the ⊣+ •)) position.
2. Insert the black lead banana plug into the negative (-) jack **COM** and the red test lead banana plug into the positive (+) jack **Ω**.
3. Press the **MODE** button until the •)) symbol appears in the display.
4. Touch the test probe tips to the circuit or wire you wish to check.
5. If the resistance is less than approximately 30Ω, the audible signal will sound. The display will also show the actual resistance.

Diode Test

WARNING: To avoid electric shock, do not test any diode that has voltage on it.

1. Set the function switch to ⊣ •)) position.
2. Press the **MODE** button until ⊣ appears in the display.
3. Insert the black test lead banana plug into the negative (-) jack **COM** and the red test lead banana plug into the positive (+) jack **Ω**.
4. Touch the test probe tips to the diode or semiconductor junction you wish to test. Note the meter reading
5. Reverse the probe polarity by switching probe position. Note this reading.
6. The diode or junction can be evaluated as follows:

   A. If one reading shows a value and the other reading shows OL, the diode is good.

   B. If both readings show OL, the device is open.

   C. If both readings are very small or 0, the device is shorted.

NOTE: The value indicated in the display during the diode check is the forward voltage.

Frequency/Duty Cycle Measurements

1. Set the rotary function switch to the “Hz %” position.
2. Press the **MODE** button to indicate **Hz** on the display.
3. Insert the black lead banana plug into the negative **COM** jack and the red test lead banana plug into the positive **Hz** jack.
4. Touch the test probe tips to the circuit under test.
5. Read the frequency on the display.
6. Press the **MODE** button again to indicate “%” on the display.
7. Read the % of duty cycle on the display.

Capacitance Measurements

WARNING: To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any capacitance measurements. Remove the batteries and unplug the line cords.

1. Set the function switch to the ⊣⊢ position.
2. Insert the black test lead banana plug into the negative (-) jack **COM** and the red test lead banana plug into the positive (+) jack ⊣⊢.
3. Touch the test leads to the capacitor to be tested.

Temperature Measurements

WARNING: To avoid electric shock, disconnect both test probes from any source of voltage before making a temperature measurement.

1. Set the function switch to ºF, or ºC position.
2. Insert the type K thermocouple probe black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the positive Temp jack.
3. Touch the Temperature Probe head to the part whose temperature you wish to measure. Keep the probes touching the part under test until the reading stabilizes (about 30 seconds).
4. Read the temperature in the display.

WARNING: To avoid electric shock, be sure the thermocouple has been removed before changing to another measurement function

Replacing the Battery

WARNING: To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery door.

1. will appear in the display when the battery drops below the operating voltage and requires replacing.
2. Turn off the meter and disconnect the test leads from the meter.
3. Remove the two screws securing the battery cover.
4. Replace the 9V battery observing the correct polarity.
5. Replace the cover and secure the two screws.

WARNING: To avoid electric shock, do not operate your meter until the battery door is in place and fastened securely.

Replacing the Fuses

WARNING: To avoid electric shock, disconnect the test leads from any source of voltage before removing the fuse cover.

1. Turn off the meter and disconnect both test leads from the meter.
2. Remove the two screws securing the battery/fuse cover and remove the battery.
3. Remove the old fuse from its holder by gently pulling it out.
4. Replace with fuse of proper size and value (0.5A/250V fast blow for the 400mA range, 10A/250V fast blow for the 10A range).
5. Replace the battery and the cover and tighten the screws.

WARNING: To avoid electric shock, do not operate your meter until the fuse door is in place and fastened securely.

Limited Warranty

Circuit-Test Electronics warrants to the original purchaser that this product be free of defect in material or workmanship for a period of 2 years from the date of purchase.

Any product which has been subjected to misuse or accidental damage is excluded from the warranty. Except as stated above, Circuit-Test Electronics makes no promises or warranties either expressed or implied including warranties of merchantability or the fitness for any particular purpose.